Lead and Copper Rule
Optimized Corrosion Control

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Purpose

- Provide background on the existing LCR requirements, including optimized corrosion control provisions.

Background

- The Lead and Copper Rule (LCR) is a treatment technique rule
  - The regulation requires systems to take certain actions to minimize lead and copper in drinking water as opposed to meeting an MCL.

- It requires public water systems (PWSs) to monitor for lead and copper.
  - While there are no MCLs associated with the LCR rule it does establish Action Levels (0.015 mg/L for lead or 1.3 mg/L for copper).
  - If the Action Level is exceeded it triggers additional actions to reduce water corrosivity, provide public education and remove lead service lines, if necessary.

Existing Monitoring Requirements

- Both community water systems (CWSs) and non-transient non-community water systems (NTNCWSs) are subject to monitoring requirements for Lead and Copper
- Systems must collect first-draw samples at taps in homes/buildings that are at high risk of lead and copper contamination
- The number of required samples varies by the size of the population served by the system
  - Systems serving > 100K people are required to take 100 samples
  - Systems serving ≤100 people are required to take 5 samples

Existing Monitoring Requirements (cont'd)

- PWSs must conduct tap monitoring every 6 months unless they qualify for reduced monitoring

- The number of required samples and sampling frequency may be reduced if systems meet certain requirements
  - Monitoring may be as infrequent as once every nine years.

- In the event a PWS exceeds designated action levels a PWS may be required to take corrective actions to minimize the levels of lead and copper in drinking water.
  - Some of these corrective actions may be required regardless of lead/copper levels for PWSs serving more than 50K people.

Corrective Actions

- When a PWS exceeds an Action Level they must conduct the following corrective actions:
  - Conduct public education
  - Implement source water monitoring and if needed treatment
  - Install or optimize corrosion control treatment (serving < 50K people)
  - Implement Lead Service Line Replacement (LSLR)
- Lead service line replacement is only required only when corrosion controls do not reduce lead and copper levels below the Action Levels.
- Some of the listed corrective actions are required of large PWSs (those exceeding 50K people served) regardless of levels of lead or copper.

Corrosion Control

- What is corrosion?
  - The International Union of Pure and Applied Chemistry (IUPAC) defines corrosion as:
    - An irreversible interfacial reaction of a material (metal, ceramic, polymer) with its environment which results in consumption of the material or in dissolution into the material of a component of the environment.

- Why do PWSs want to control corrosion
  - Corrosion can cause dissolution of lead or copper in pipes into drinking water.

- Corrosion control approaches in the lead and copper rule.
  - pH/Alkalinity adjustment
  - Corrosion inhibitor addition (e.g. orthophosphate, silica)
  - Calcium carbonate precipitation

Corrosion Controlling Treatment Methods

- Increasing the pH of water may decrease the solubility of lead and copper in water.
    - Sodium Carbonate (NA_2CO_3), Lime ($Ca(HO)_2$), and Sodium Hydroxide ($NaOH$) are three common agents used to increase the pH of drinking water.
    - Higher pH in drinking water can cause disinfection byproducts (such as Chloroform) when chlorine based disinfectants are used to treat drinking water.

- Injecting orthophosphates into the drinking water creates a coating of the corrosive sites on pipes.
    - The coating hinders the ability of lead or copper to dissolve into the drinking water.
    - There is an optimal pH range (7.2-7.8) to ensure proper orthophosphate coverage throughout the distribution system.
    - Orthophosphate use may result in increased nutrients discharged to receiving waters.

Corrosion Controlling Treatment Methods (cont'd)

- Precipitating calcium carbonate in water distribution system.
  - Precipitation may be achieved through the addition of lime which will add calcium ions and increase pH.

- The calcium carbonate forms a protective scale on the distribution system piping preventing corrosion.
  - This is not a preferred method of corrosion control for PWSs
  - It is difficult to precipitate an even scale throughout the distribution system.
  - Precipitation may be heavy close to the treatment plant and there may be little to no scale precipitated at the ends of the distribution system.

Existing Corrosion Control Requirements

- Most large PWSs (serving > 100K people) and medium and small systems that exceed either the lead or copper Action Level are required to optimize their corrosion control treatment (CCT).

- All large PWSs and some small and medium PWSs are required to conduct a study of their system to determine the best CCT to install.
  - This study must be completed in 18 months.
  - Once the best CCT has been approved by the state, the PWS has 24 months to install the technology.

Corrosion Control Requirements (Cont'd)

- Systems installing CCT, must conduct follow-up monitoring for 2 consecutive 6-month periods. This monitoring includes both tap and entry point monitoring for
  - Lead and copper
  - State designated water quality parameters which may include: pH, Alkalinity, calcium, conductivity, orthophosphate, silica, and temperature.

- After follow-up monitoring has been completed, the State reviews the data and sets Optimal Water Quality Parameter (OWQP) specifications that define optimal CCT.
  - Compliance with the LCR is determined by meeting the OWQP
  - Monitoring continues at the tap every six months and at the entry point to the distribution system every two weeks.
  - Consistently meeting the OWQPs can reduce the frequency at which tap monitoring is required.
  - Tap monitoring may be as infrequent as once every nine years.

Questions?